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Constantinof

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(54) **EMERGENCY SERVICES FOR PACKET NETWORKS**

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Related U.S. Application Data

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(51) **Int. Cl.**
H04M 7/00 (2006.01)

(52) **U.S. Cl.**
USPC **379/221.02**; 379/37; 379/45; 370/352; 709/204

(58) **Field of Classification Search**
USPC 379/221.02, 37, 45; 370/352; 709/204
See application file for complete search history.

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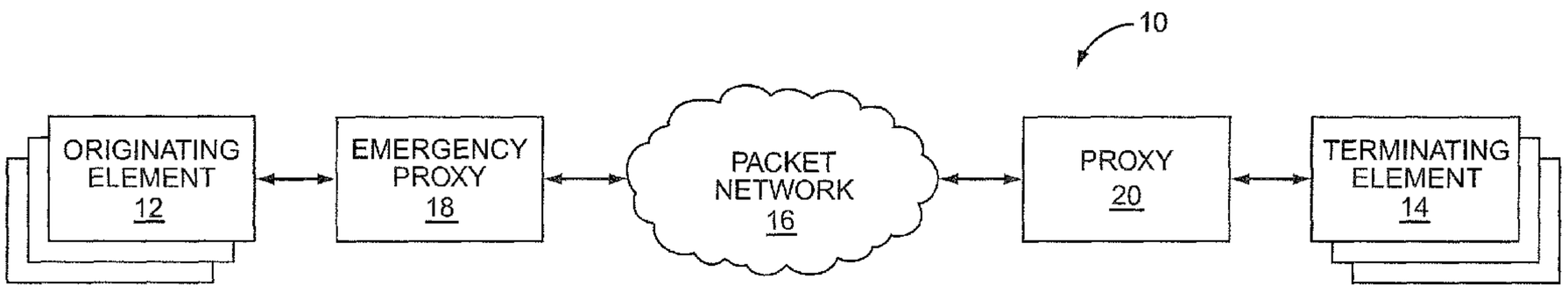
(57) **ABSTRACT**

The present invention provides a technique for facilitating emergency services via packet networks. Emergency service providers will implement emergency proxies to ensure that proper call setup requests for emergency services are forwarded to the appropriate entities, even if those entities are in overload conditions. The emergency proxies may authenticate and filter call setup requests to ensure that only proper call setup requests are forwarded to help prevent such overload conditions. The emergency proxies may operate solely in a packet network, as well as at the interface between a packet network and a circuit-switched network to assist in call setup requests originating from either the packet network or the circuit-switched network.

20 Claims, 5 Drawing Sheets



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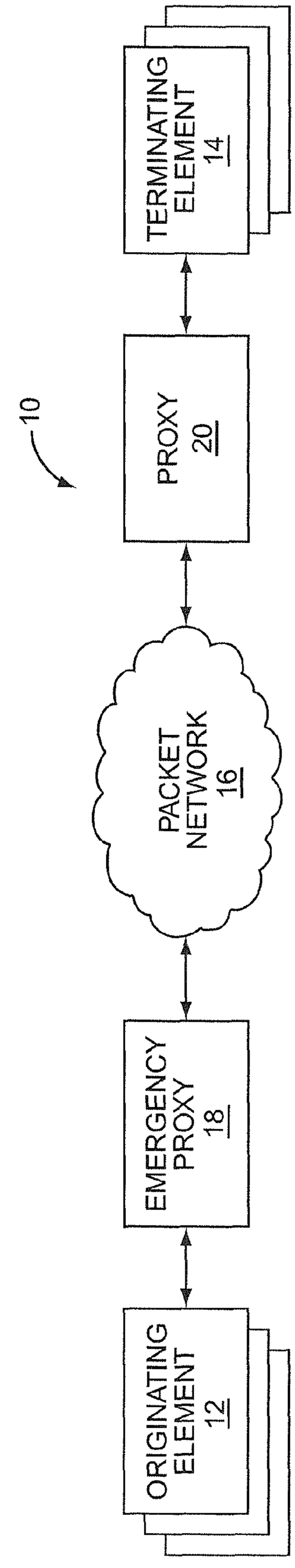
10
ORIGINATING ELEMENT 12
EMERGENCY PROXY 18
PROXY 20
PACKET NETWORK 16
TERMINATING ELEMENT 14

FIG. 1

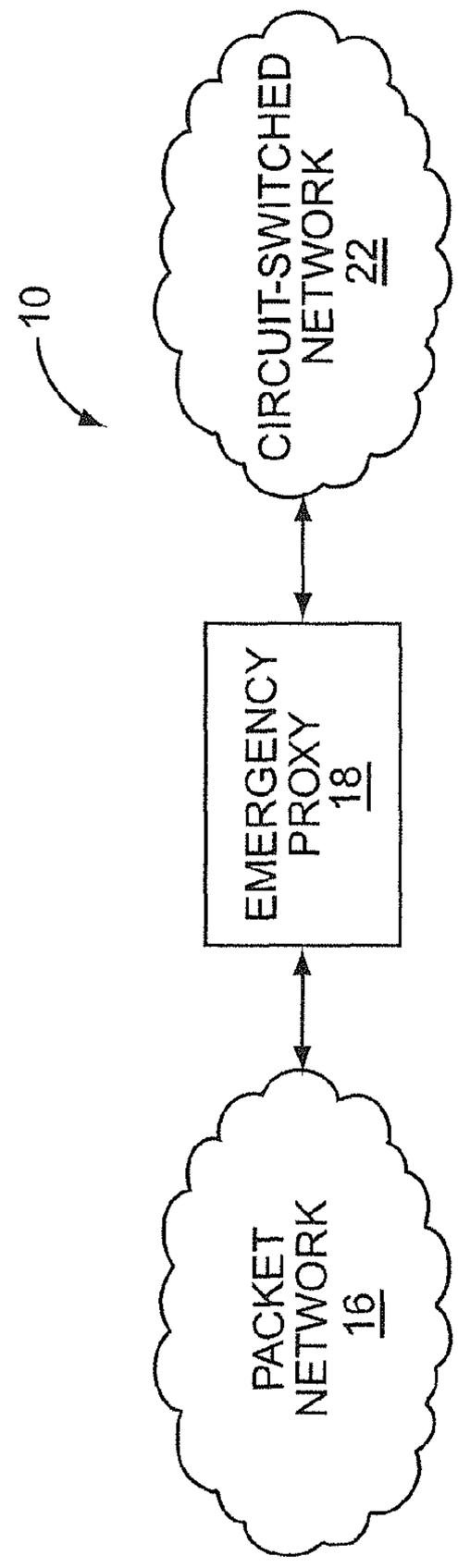
10
EMERGENCY PROXY 18
CIRCUIT-SWITCHED NETWORK 22
PACKET NETWORK 16

FIG. 3

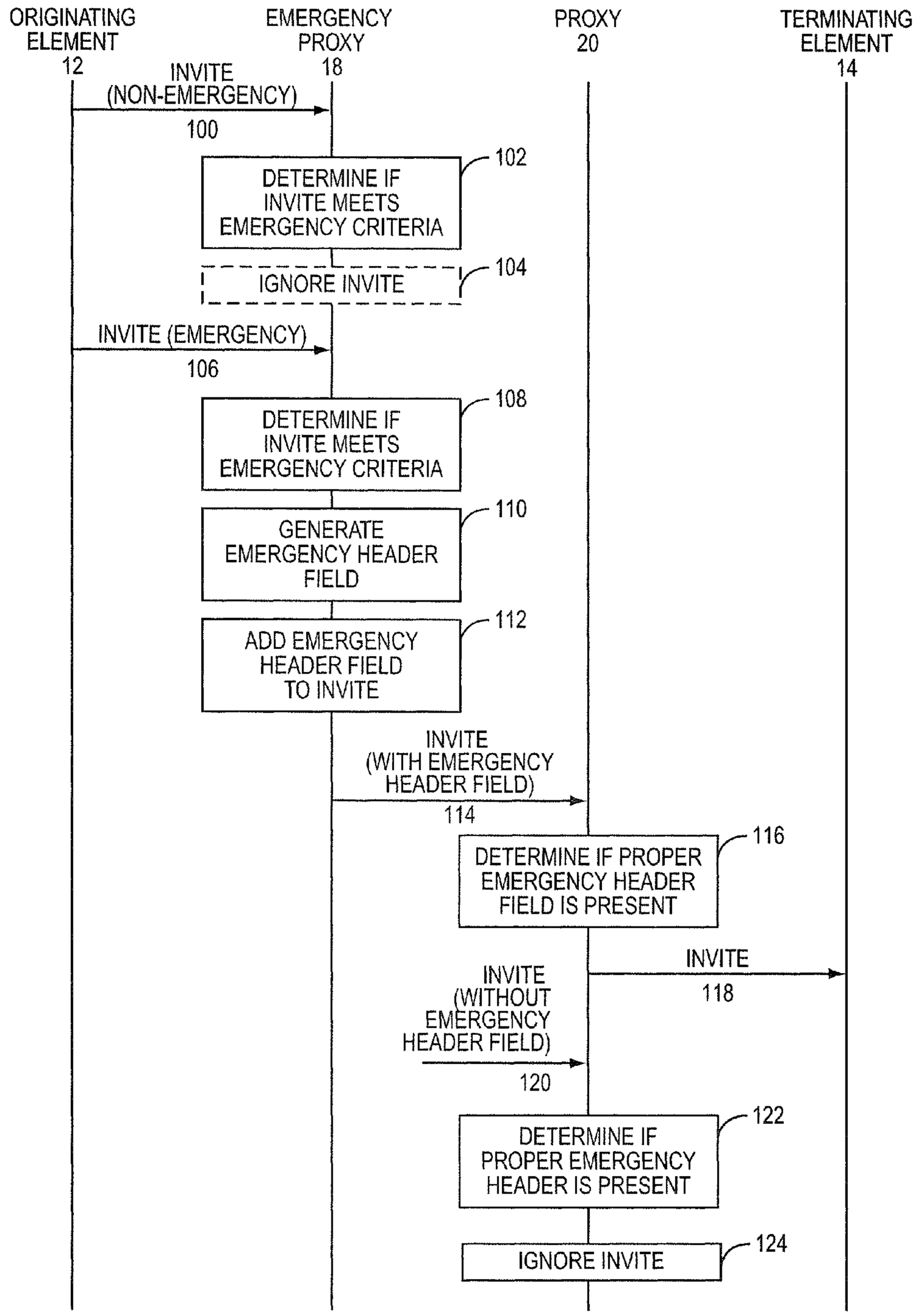
ORIGINATING ELEMENT 12
EMERGENCY PROXY 18
PROXY 20
TERMINATING ELEMENT 14
INVITE (NON-EMERGENCY)
100
DETERMINE IF INVITE MEETS EMERGENCY CRITERIA
102
IGNORE INVITE
104
INVITE (EMERGENCY)
106
DETERMINE IF INVITE MEETS EMERGENCY CRITERIA
108
GENERATE EMERGENCY HEADER FIELD
110
ADD EMERGENCY HEADER FIELD TO INVITE
112
INVITE (WITH EMERGENCY HEADER FIELD)
114
DETERMINE IF PROPER EMERGENCY HEADER FIELD IS PRESENT
116
INVITE
118
INVITE (WITHOUT EMERGENCY HEADER FIELD)
120
DETERMINE IF PROPER EMERGENCY HEADER IS PRESENT
122
IGNORE INVITE
124

FIG. 2

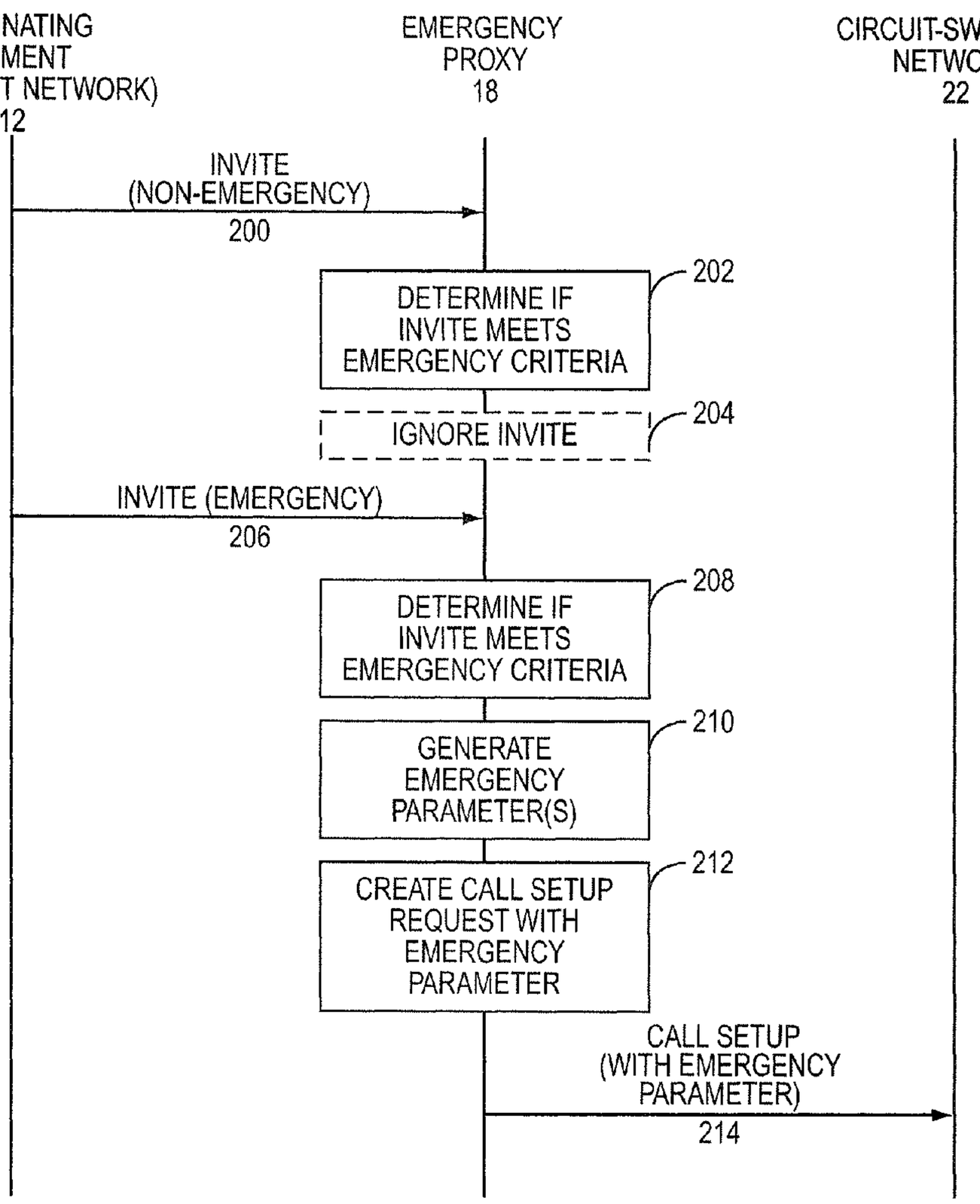
ORIGINATING ELEMENT (ON PACKET NETWORK) 12
EMERGENCY PROXY 18
CIRCUIT-SWITCHED NETWORK 22
INVITE (NON-EMERGENCY) 200
DETERMINE IF INVITE MEETS EMERGENCY CRITERIA
202
IGNORE INVITE
204
INVITE (EMERGENCY) 206
DETERMINE IF INVITE MEETS EMERGENCY CRITERIA
208
GENERATE EMERGENCY PARAMETER(S)
210
CREATE CALL SETUP REQUEST WITH EMERGENCY PARAMETER
212
CALL SETUP (WITH EMERGENCY PARAMETER) 214

FIG. 4

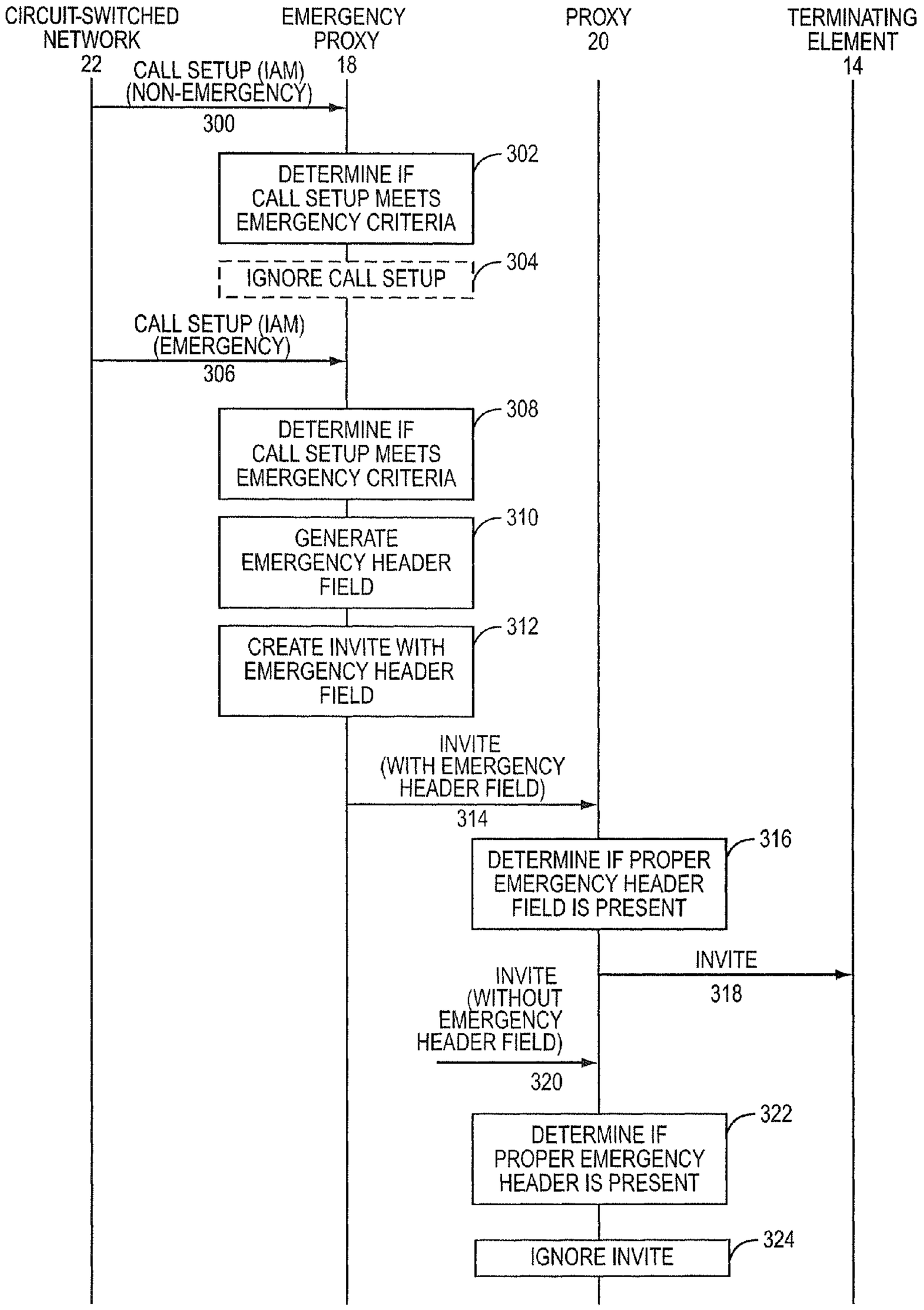
CIRCUIT-SWITCHED NETWORK
22
EMERGENCY PROXY
18
PROXY
20
TERMINATING ELEMENT
14
CALL SETUP (IAM) (NON-EMERGENCY)
300
DETERMINE IF CALL SETUP MEETS EMERGENCY CRITERIA
302
IGNORE CALL SETUP
304
CALL SETUP (IAM) (EMERGENCY)
306
DETERMINE IF CALL SETUP MEETS EMERGENCY CRITERIA
308
GENERATE EMERGENCY HEADER FIELD
310
CREATE INVITE WITH EMERGENCY HEADER FIELD
312
INVITE (WITH EMERGENCY HEADER FIELD)
314
DETERMINE IF PROPER EMERGENCY HEADER FIELD IS PRESENT
316
INVITE
318
INVITE (WITHOUT EMERGENCY HEADER FIELD)
320
DETERMINE IF PROPER EMERGENCY HEADER IS PRESENT
322
IGNORE INVITE
324

FIG. 5

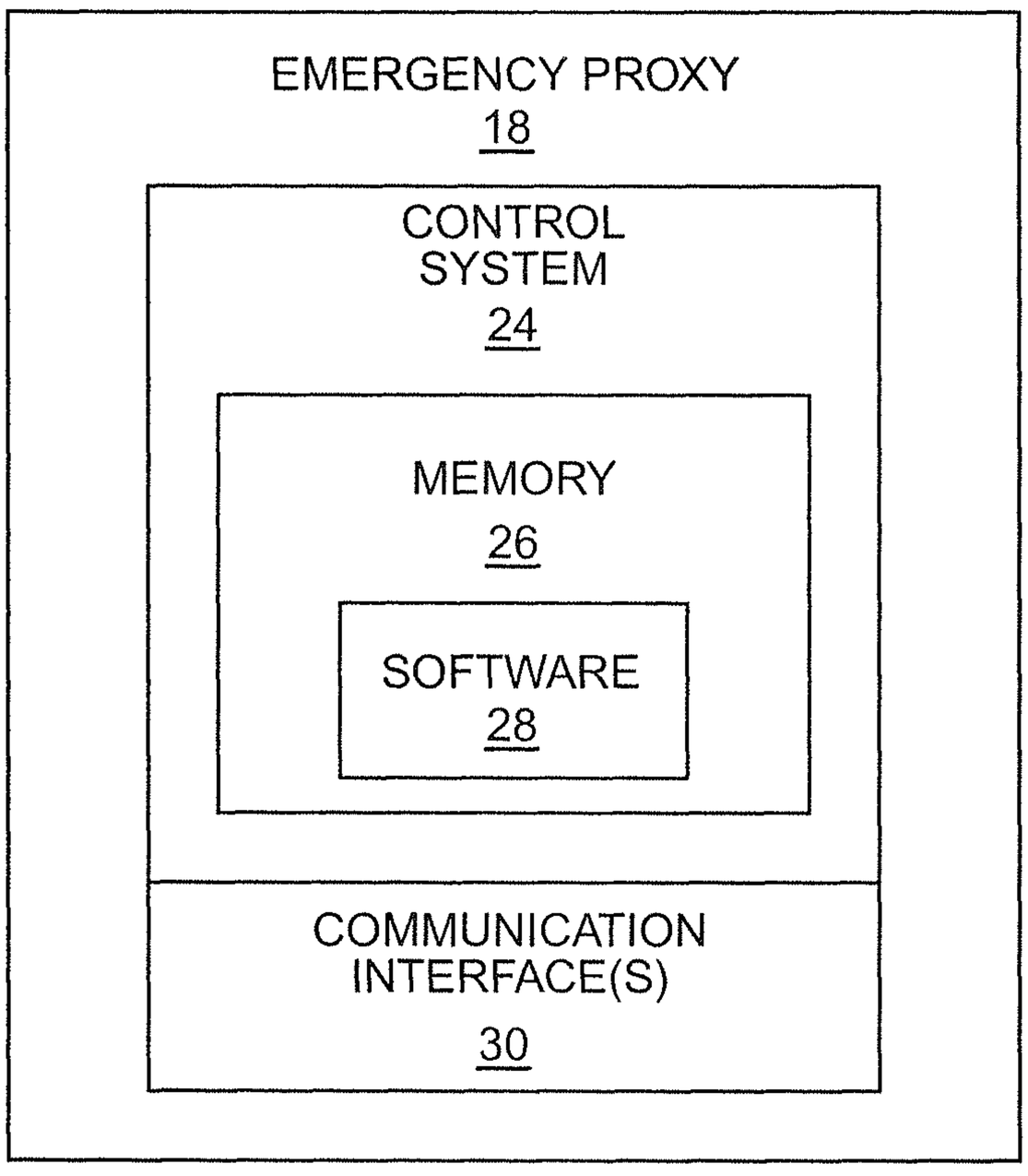
EMERGENCY PROXY
18
CONTROL SYSTEM
24
MEMORY
26
SOFTWARE
28
COMMUNICATION INTERFACE(S)
30

FIG. 6

EMERGENCY SERVICES FOR PACKET NETWORKS

CROSS-REFERENCE TO RELATED APPLICATION

The present application is a continuation of U.S. patent application Ser. No. 10/606,687, filed on Jun. 26, 2003, the disclosure of which is hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

The present invention relates to communications, and in particular to ensuring emergency calls supported in part over a packet network are properly handled, even during overload conditions.

BACKGROUND OF THE INVENTION

Providing emergency services, especially in overload conditions, is challenging since service providers have to ensure that emergency calls are established regardless of other non-emergency calls. In the public switched telephone network (PSTN), there are mechanisms to identify calls made from and to special locations which involve providing emergency services. These locations include 911 call centers, police departments, hospitals, fire stations, and various government agencies. Generally, excessive network resources are reserved to ensure completion of emergency calls, and call setup requests for requesting the establishment of a call are given processing priority when they are within the various switching nodes within the PSTN. Accordingly, the PSTN currently has the ability to properly prioritize and handle emergency calls.

With respect to packet-based communications, packet networks are increasingly being used to deploy voice-based communications using various types of voice over packet (VoP) calls. Unfortunately, the openness of packet-based architectures has presented a challenge for properly handling emergency calls. Although there are numerous packet-based devices which can filter and route calls, this is no overriding solution for ensuring emergency calls are properly processed and prioritized over non-emergency calls. Further, there is a need to ensure that emergency calls can be properly handled in overload conditions as well as ensure that the system is not abused by malicious users who improperly identify their calls as emergency calls or initiate malicious attacks, such as denial of service attacks.

SUMMARY OF THE INVENTION

The present invention provides a technique for facilitating emergency services via packet networks. Emergency service providers will implement emergency proxies to ensure that proper call setup requests for emergency services are forwarded to the appropriate entities, even if the network or those entities are in overload conditions. The emergency proxies may authenticate and filter call setup requests to ensure that only proper call setup requests are forwarded to help prevent abusive, malicious or unauthorized use of emergency services. The emergency proxy may operate solely in a packet network, as well as at the interface between a packet network and a circuit-switched network to assist in call setup requests originating from either the packet network or the circuit-switched network.

Those skilled in the art will appreciate the scope of the present invention and realize additional aspects thereof after reading the following detailed description of the preferred embodiments in association with the accompanying drawing figures.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

The accompanying drawing figures incorporated in and forming a part of this specification illustrate several aspects of the invention, and together with the description serve to explain the principles of the invention.

FIG. **1** is a block representation of a communication environment according to one embodiment of the present invention.

FIG. **2** is a communication flow diagram providing an exemplary scenario for implementing emergency services according to one embodiment of the present invention.

FIG. **3** is a block representation of a communication environment according a second embodiment of the present invention.

FIG. **4** is a communication flow diagram providing an exemplary scenario for implementing emergency services according to a second embodiment of the present invention.

FIG. **5** is a communication flow diagram providing an exemplary scenario for implementing emergency services according to a third embodiment of the present invention.

FIG. **6** is a block representation of an emergency proxy according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The embodiments set forth below represent the necessary information to enable those skilled in the art to practice the invention and illustrate the best mode of practicing the invention. Upon reading the following description in light of the accompanying drawing figures, those skilled in the art will understand the concepts of the invention and will recognize applications of these concepts not particularly addressed herein. It should be understood that these concepts and applications fall within the scope of the disclosure and the accompanying claims.

With reference to FIG. **1**, a communication environment **10** is provided wherein an originating element **12** is a communication device attempting to establish a call to a terminating element **14** via a packet network **16**. For the present invention, the term "call" includes traditional voice-based calls, as well as media sessions, which include any type of data, audio, voice, or video based packet sessions. In the illustrated embodiment, the originating element **12** is supported by an emergency proxy **18**, and the terminating element **14** may be supported by a proxy **20** in traditional fashion, wherein the emergency proxy **18** and the proxy **20** will act as liaisons for call or session establishment messages involving the respective devices.

Accordingly, the originating element **12** will send a call setup request configured to initiate a call between the originating element **12** and the terminating element **14**. In traditional proxy fashion, the call setup request is received by the emergency proxy **18**, which will determine if the call setup request meets the emergency criteria of an emergency call setup request. The emergency criteria are preferably provisioned by emergency services providers, such that these providers can effectively control how call setup requests are processed. If the emergency criteria are met, the emergency

proxy **18** will modify the call setup request in a defined manner and forward the call setup request across the packet network **16** to initiate the call. The call setup request may be forwarded to the terminating element **14** directly or indirectly via the proxy **20**. In one embodiment, the proxy **20** may be configured to analyze the call setup request to ensure that the call setup request is properly configured by the emergency proxy **18** as a condition to sending the call setup request to the terminating element **14**. As such, the emergency proxy **18** and perhaps the proxy **20** are configured to process call setup requests from the originating element **12** to ensure that only authorized call setup requests result in emergency calls, by effectively filtering call setup requests actually delivered to the terminating element **14** or supporting entities.

Preferably, the emergency proxy **18** will authenticate the call setup request to ensure that the originating element **12** can initiate a request for an emergency call, as well as limit the call setup requests sent toward the terminating element **14** to those that are authenticated. The emergency proxy **18** may add an additional field, referred to in general as an emergency header field, to the call setup request. The emergency header field may include additional information that uniquely identifies the level of emergency, and information identifying the call, such as caller identification, to and from addresses, and the like. For additional security to avoid malicious or unauthorized use of emergency services, the emergency proxy **18** may encrypt the emergency header field information in a manner allowing the proxy **20**, terminating element **14**, or other supporting entity to be able to decrypt information when attempting to establish an emergency call. Notably, private or public key encryption techniques may be employed that are well known in the art. Authentication of call setup requests or an originating element **12** sending the call setup request may be based on the identity of the originating element **12**, a user of the originating element **12**, or authentication information provided when generating the call setup request. The emergency proxy **18** will be provisioned with the necessary information to facilitate authentication of the various originating elements **12** that are served by the emergency proxy **18**.

Notably, the emergency proxy **18** may provide multiple levels of prioritization for various types of call setup requests and may filter call setup requests according to these priority levels and network conditions, as well as include indicia indicating an assigned prioritization level in each call setup request. The receiving proxy **20**, terminating element **14**, any other intermediate proxy or supporting entity, if any, will process the incoming call setup request according to the assigned prioritization level, network conditions, and the like.

In a preferred embodiment, at least a portion of the communication sessions established between the originating element **12** and the terminating element **14** are facilitated using the Session Initiation Protocol (SIP). The specification for SIP is provided in the Internet Engineering Task Force's Request for Comments (RFC) 3261: Session Initiation Protocol Internet Draft, which is incorporated herein by reference in its entirety. In general, SIP is used to establish media sessions between any number of endpoints, such as the originating and terminating elements **12**, **14**. Typically, these endpoints may support any number or combination of data, audio, and voice media sessions, depending on the configuration of the device. A SIP endpoint is capable of running an application, typically referred to as a user agent (UA), which is capable of facilitating media sessions using SIP.

In certain embodiments, user agents may register their ability to establish sessions with a SIP proxy, such as the emergency proxy **18** or proxy **20**, by sending REGISTER messages to the SIP proxy. The REGISTER message informs the SIP proxy of the SIP universal resource locator (URL) that identifies the user agent to the SIP network. The REGISTER message also contains information about how to reach specific user agents over the SIP network, typically by providing the Internet Protocol (IP) address and port that the user agent will use for SIP sessions. When a user agent wants to establish a session with another user agent, the user agent initiating the session may send an INVITE message to the SIP proxy and specify the target user agent in the TO header of the INVITE message. Identification of the user agent takes the form of a SIP URL. The SIP proxy will use the SIP URL in the TO header of the message to determine if the targeted user agent is registered with the SIP proxy. Generally the user name is unique within the name space of the specified domain.

If the targeted user agent has registered with the SIP proxy, the SIP proxy will forward the INVITE message directly to the targeted user agent. The targeted user agent will respond with a 200 OK message, and a session between the respective user agents will be established as per the message exchange required in the SIP specification. Media capabilities are passed between the two user agents of the respective endpoints as parameters embedded within the session setup messages, such as the INVITE, 200 OK, and acknowledgement (ACK) messages. Media capabilities may be exchanged in other messages, such as the SIP INFO message. Media capabilities are typically described using the Session Description Protocol

(SDP). Once respective endpoints are in an active session with each other and have determined each other's capabilities, the specified media content may be exchanged during an appropriate media session.

According to the Internet Engineering Task Force's RFC 3261, a user agent is an application that contains both a user agent client and a user agent server. A user agent client generally refers to a client application that initiates SIP requests, wherein a user agent server is an application that contacts the user when a SIP request is received, and returns a response on behalf of the user. Typically, the response accepts, rejects, or redirects the received request.

With reference to FIG. **2**, a communication flow diagram is provided from an exemplary scenario wherein one or more originating elements **12** are sending call setup requests in the form of INVITE messages to initiate a call via a SIP session with one or more terminating elements **14**. Assume that the terminating elements **14** provide emergency services and only emergency calls should be handled by the terminating elements **14**. Accordingly, the emergency proxy **18** will only forward incoming call setup requests, in the form of SIP INVITE messages, which meet the necessary criteria for being emergency call setup requests to the terminating elements **14**. Initially, assume that an INVITE message intended to establish a call with a terminating element **14** is sent from the originating element **12** (step **100**). Further assume that the originating element **12** is either unauthorized to establish an emergency call or that the INVITE message would not meet the necessary criteria for establishing an emergency call. As such, the emergency proxy **18** will determine if the INVITE message meets the defined emergency criteria (step **102**), and since this INVITE message would not meet the emergency criteria, the emergency proxy **18** will ignore the INVITE message and not forward the INVITE message toward the terminating element **14** (step **104**). The emergency proxy **18** may be configured to provide a response indicative of not forwarding the INVITE message back to the originating element **12** (not shown)

Next, assume that an appropriate originating element **12** sends a proper INVITE message for initiating an emergency call to the terminating element **14**. The emergency proxy **18** will receive the INVITE message (step **106**), and determine if the INVITE message meets the emergency criteria (step **108**). Since the INVITE message meets the emergency criteria, the emergency proxy **18** generates an emergency header field (step **110**) and adds the emergency header field to the INVITE message (step **112**). The INVITE message is then forwarded toward the terminating element **14** (step **114**). Since the terminating element **14** is associated with a proxy **20**, the proxy **20** will receive the INVITE message on behalf of the terminating element **14** and may be configured to determine if the proper emergency header field is present (step **116**). If the proper emergency header field is present, the INVITE message is forwarded to the terminating element **14** wherein the session supporting the call can be established with the originating element **12** (step **118**).

In the event that the proxy **20** receives an INVITE message without the proper emergency header field from any device (step **120**), the proxy **20** will determine if the proper emergency header field is present (step **122**), and since the field is not present, may ignore the INVITE message (step **124**). As such, the emergency proxy **18** provides the proper authentication and filtering for call setup requests to ensure that terminating elements **14** providing emergency services are only sent appropriate call setup requests. Further, the proxy **20** supporting the terminating elements **14** may provide further authentication and filtering to ensure that the terminating element **14** only receives appropriate call setup requests. Again, further security may be provided using encryption and decryption techniques between the emergency proxy **18** and the proxy **20**. The proxy **20** and the emergency proxy **18** may also monitor work conditions to help provide filtering for the various call setup requests, as well as prioritize the call setup requests based on any available criteria.

Turning now to FIG. **3**, the concepts of the present invention readily extend to circuit-switched networks **22**, such as the PSTN, wherein an emergency proxy **18** is implemented in or in association with a gateway facilitating an interface between the packet network **16** and the circuit-switched network **22**. In such a configuration, the emergency proxy **18** can control circuit-switched call setup requests as well as packet-based call setup requests originating from the circuit-switched network **22** and the packet network **16**, respectively.

An exemplary communication call flow for filtering call setup requests originating from the packet network **16** and intended for a device on the circuit-switched network **22** is provided in FIG. **4**. In this example, an initial INVITE message, which does not meet the emergency criteria, is sent from the originating element **12** to establish an emergency call with a device in the circuit-switched network **22**. The emergency proxy **18** will receive the INVITE message (step **200**) and determine if the INVITE message meets the emergency criteria (step **202**). Since the emergency criteria are not met, the emergency proxy **18** will ignore the INVITE message (step **204**) and perhaps report the same back to the originating element **12** (not shown).

When an appropriate INVITE message is sent from an originating element **12** (step **206**), the emergency proxy **18** will receive the INVITE message and determine if the INVITE message meets the emergency criteria (step **208**). Since the emergency criteria is met, the emergency proxy **18** may generate one or more emergency parameters (step **210**) and create a call setup request with the emergency parameter (step **212**), wherein the call setup request is configured to initiate a call in the circuit-switched network **22**. An exemplary call setup request for the PSTN is an intelligent network Initial Address Message (IAM). As such, the emergency proxy **18** will send a call setup request to the appropriate entity in the circuit-switched network **22** to initiate the emergency call (step **214**). The call setup request will include the emergency parameters to assist the entities in the circuit-switched network **22** in determining whether the call setup request is appropriate. The emergency parameters may be carried in signaling information elements as specified by the appropriate standards that define the Multi-Level Precedence and Preemption Supplementary Service, which is well known and provides for prioritizing voice traffic.

Turning now to FIG. **5**, assume that entities in the circuit-switched network **22** are attempting to establish emergency calls with a terminating element **14** in the packet network **16**. Accordingly, call setup requests in the form of IAMs are received by the emergency proxy **18** from the circuit-switched network **22** (step **300**). Assume that the first call setup request would not meet the emergency criteria for establishing an emergency call with the terminating element **14**, and as such, the emergency proxy **18** will determine that the call setup request does not meet the emergency criteria (step **302**) and will ignore the call setup request (step **304**). Again, the call setup request may be an IAM, which may include various parameters to assist in determining whether the emergency criteria are met.

Assume that another call setup request, which would meet the emergency criteria, is received by the emergency proxy **18** from the circuit-switched network **22** (step **306**). The emergency proxy **18** will determine if the call setup request meets the emergency criteria (step **308**) and since it does meet the emergency criteria, the emergency proxy **18** will generate an emergency header field (step **310**) and create an INVITE message intended for the terminating element **14** with the emergency header field (step **312**). The emergency proxy **18** will then send the INVITE message with the emergency header field toward the terminating element **14**. The proxy **20** will receive the INVITE message (step **314**) and may be configured to determine if a proper emergency header field is present (step **316**). If the proper emergency header field is present, the INVITE message is forwarded to the terminating element **14** to establish the emergency call (step **318**). Notably, the session between the emergency proxy **18** or associated gateway and the terminating element **14** may be a SIP session, wherein the connection within the circuit-switched network **22** will be a circuit-switched connection. As described above, the proxy **20** may receive INVITE messages without the proper emergency header field (step **320**), and then determine if the proper emergency header is present (step **322**). When the proper emergency header field is not present, the INVITE message may be ignored (step **324**).

With any of the above embodiments, the emergency proxy **18** will preferably be configured to ensure that a proper call setup request is always forwarded to or towards the terminating element **14**, even in overload conditions. Further, in non-overload conditions, the emergency proxy **18** as well as the proxy **20** may be configured to forward all of select INVITE messages or forward them based on desired criteria, yet prioritize emergency requests as well as eliminate non-emergency requests during overload conditions.

With reference to FIG. **6**, a high level block diagram of an emergency proxy or device capable of performing the function of an emergency proxy is illustrated. The emergency proxy **18** will typically include a control system **24** having memory **26** for storing the necessary software **28** to facilitate the above functionality. The control system **24** will also be associated with one or more communication interfaces **30** for

communicating over the packet network **16**, and perhaps the circuit-switched network **22**, as necessary.

Those skilled in the art will recognize improvements and modifications to the preferred embodiments of the present invention. All such improvements and modifications are considered within the scope of the concepts disclosed herein and the claims that follow.

What is claimed is:

1. A method of controlling access to an emergency service, comprising:

receiving at least one call setup request from at least one originating device;

determining whether a received call setup request is received from a user who is authorized to initiate a call to the emergency service;

selecting a priority level from a plurality of priority levels for the call setup request;

inserting at least one indication of the determination and the selected priority level into the call request; and

forwarding the call request including the at least one indication toward at least one terminating device associated with the emergency service, wherein at least one of the originating devices or terminating devices resides on a packet network.

2. A method as recited in claim **1**, wherein received call setup requests determined to be received from users who are not authorized to initiate a call to the emergency service are not forwarded toward terminating devices associated with the emergency service.

3. A method as recited in claim **1**, further comprising creating emergency information for each call setup request determined to be received from a user who is authorized to initiate a call to the emergency service;

wherein the step of inserting at least one indication of the determination and the selected priority level into the call request comprises inserting the emergency information into the call setup request.

4. A method as recited in claim **1**, wherein the step of inserting at least one indication of the determination and the selected priority level comprises inserting the at least one indication of the determination and the selected priority level into a header of the call setup request.

5. A method as recited in claim **1**, wherein the step of forwarding the call request is dependent on the step of determining whether the received call request is from a user who is authorized to initiate a call to the emergency service, at least when at least one network resource required to forward the call request toward the at least one terminating device or at least one of the terminating devices is in an overload condition.

6. A method as recited in claim **5**, wherein a call request is not forwarded toward the at least one terminating device when the received call request is determined not to be from a user who is authorized to initiate a call to the emergency service.

7. A method as recited in claim **1**, further comprising registering users authorized to initiate calls to the emergency service in response to received registration messages.

8. A method as recited in claim **1**, further comprising processing the call setup request in accordance with the selected priority level at a network element upstream of at least one terminating device associated with the emergency service.

9. A method as recited in claim **1**, wherein the call setup request is a request for a communication session of a type selected from the group consisting of data, audio, voice and video.

10. A system for controlling access to an emergency service, comprising:

at least one communication interface; and

a control system associated with the at least one communication interface and configured to:

receive at least one call setup request from at least one originating device;

determine whether a received call setup request is received from a user who is authorized to initiate a call to the emergency service;

select a priority level from a plurality of priority levels for the call setup request;

insert at least one indication of the determination and the selected priority level into the call request; and

forward the call request including the at least one indication toward at least one terminating device associated with the emergency service, wherein at least one of the originating devices or terminating devices resides on a packet network.

11. A system as recited in claim **10**, wherein the control system is configured to not forward toward terminating devices associated with the emergency service received call setup requests determined to be received from users who are not authorized to initiate a call to the emergency service.

12. A system as recited in claim **10**, wherein the control system is further configured to:

to create emergency information for each call setup request determined to be received from a user who is authorized to initiate a call to the emergency service; and

to insert the emergency information into the call setup request.

13. A system as recited in claim **10**, wherein the control system is configured to insert at least one indication of the determination and the selected priority level by inserting the at least one indication of the determination and the selected priority level into a header of the call setup request.

14. A system as recited in claim **10**, wherein the control system is configured to forward the call request dependent on the determination of whether the received call request is from a user authorized to initiate a call to the emergency service, at least when at least one network resource required to forward the call request toward the at least one terminating device or at least one of the terminating devices is in an overload condition.

15. A system as recited in claim **14**, wherein the control system is configured to not forward a call request toward the at least one terminating device when the received call request is determined not to be from a user who is authorized to initiate a call to the emergency service.

16. A system as recited in claim **10**, wherein the control system is further configured to register users authorized to initiate calls to the emergency service in response to received registration messages.

17. A system as recited in claim **10**, further comprising at least one network element upstream of at least one terminating device associated with the emergency service, the network element being configured to process the call setup request in accordance with the selected priority level.

18. A non-transitory computer-readable medium carrying software for controlling access to an emergency service, the software comprising instructions executable by a processor to:

receive at least one call setup request from at least one originating device;

determine whether a received call setup request is received from a user who is authorized to initiate a call to the emergency service;

select a priority level from a plurality of priority levels for the call setup request;

insert at least one indication of the determination and the selected priority level into the call request; and

forward the call request including the at least one indication toward at least one terminating device associated with the emergency service;

wherein at least one of the originating devices or terminating devices resides on a packet network.

19. A computer-readable medium as recited in claim **18**, wherein the instructions executable to forward the call request are executed dependent on the determination of whether the received call request is from a user who is authorized to initiate a call to the emergency service, at least when at least one network resource required to forward the call request toward the at least one terminating device or at least one of the terminating devices is in an overload condition.

20. A computer-readable medium as recited in claim **18**, wherein the instructions further comprise instructions executable to register users authorized to initiate calls to the emergency service in response to received registration messages.

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